WHAT IS CLAIMED IS:

1. A system for optically characterizing a device under test (DUT) comprising:

a local oscillator source that generates a local oscillator signal;

a beam expander, in optical communication with said local oscillator source, which generates an expanded local oscillator signal; and

optical path elements, in optical communication with said local oscillator source, which cause said expanded local oscillator signal to be combined with light received from a DUT for use in multiple parallel interferometric measurements.

2. The system of claim 1 wherein said optical path elements include a lens array connected to receive said expanded local oscillator signal, said lens array outputting multiple beams of said expanded local oscillator signal.

3. The system of claim 2 wherein said optical path elements further include a coupling system, in optical communication with said lens array, which couples said multiple beams of said expanded local oscillator signal to distinct optical waveguides.

4. The system of claim 3 wherein said optical path elements further include multiple optical couplers that are in optical communication with said distinct optical waveguides, wherein said multiple optical couplers combine, into combined optical signals, said multiple beams of said expanded local oscillator signal with light from said DUT.

5. The system of claim 4 further including multiple optical detectors for detecting said combined optical signals in parallel.

6. The system of claim 1 wherein said optical path elements include:

a beam splitter for splitting said expanded local oscillator signal; and

a mirror that is in optical communication with said beam splitter to receive a first portion of said expanded local oscillator signal;

said beam splitter being oriented such that a second portion of said expanded local oscillator signal can be applied to said DUT and such that said first portion of said expanded local oscillator signal is combined with portions of said expanded local oscillator signal that are received from said DUT.

7. The system of claim 6 wherein said optical path elements further include a lens array oriented to receive said second portion of said expanded local oscillator signal, said lens array outputting multiple beams of said second portion of said split expanded local oscillator signal.

8. The system of claim 7 wherein said optical path elements further include a coupling system, in optical communication with said lens array, for coupling said multiple beams that are output from said lens array to distinct optical waveguides, said distinct optical waveguides providing optical coupling to said DUT.

9. The system of claim 7 further including a detector array for detecting, in parallel, combined optical signals, said combined optical signals being formed from said first and second portions of said expanded local oscillator signal.

10. The system of claim 9 wherein said detector array includes multiple detector elements that are optically aligned with lens elements of said lens array.

11. A system for optically characterizing a device under test (DUT) comprising:

a local oscillator source that generates a local oscillator signal;

a beam expander, in optical communication with said local oscillator source, which expands at least a portion of said local oscillator signal; and

a detection system, in optical communication with said local oscillator source and said beam expander, which performs multiple parallel interferometric measurements related to a DUT using said expanded portion of said local oscillator signal.

12. The system of claim 11 wherein said local oscillator source is optically connectable to said DUT for providing a portion of said local oscillator signal to said DUT and wherein said beam expander is in optical communication with a lens array to provide an expanded local oscillator signal to said lens array, said lens array outputting multiple beams of said expanded local oscillator signal in response to said expanded local oscillator signal.

13. The system of claim 12 further including optical couplers, which combine portions of said local oscillator signal that are output from said DUT with said multiple beams of said expanded local oscillator signal that are output from said lens array.

14. The system of claim 13 further including multiple detectors for detecting said combined optical beams in parallel.

15. The system of claim 11 further including:

a beam splitter for splitting said expanded local oscillator signal; and

a mirror that is in optical communication with said beam splitter to receive a first portion of said expanded local oscillator signal;

said beam splitter being oriented such that a second portion of said expanded local oscillator signal can be applied to said DUT and such that said first portion of said expanded local oscillator signal is combined with portions of said expanded local oscillator signal that are received from said DUT.

16. The system of claim 15 further including a lens array oriented to receive said second portion of said expanded local oscillator signal, said lens array outputting multiple beams of said second portion of said expanded local oscillator signal.

17. The system of claim 16 further including a coupling system, in optical communication with said lens array, which couples said multiple beams that are output from said lens array to said DUT.

18. The system of claim 16 wherein said detection system includes a detector array that detects, in parallel, combined optical signals, said combined optical signals being formed from said first and second portions of said expanded local oscillator signal.

19. The system of claim 18 wherein said detector array includes multiple detector elements that are optically aligned with lens elements of said lens array.

20. A method for optically characterizing a device under test (DUT) comprising:
generating an expanded local oscillator signal; and
combining said expanded local oscillator signal with light from a DUT for use in multiple parallel interferometric measurements.

21. The method of claim 20 further including focusing at least a portion of said expanded local oscillator signal into multiple beams.

22. The method of claim 21 further including combining, into combined optical signals, said multiple beams with light from said DUT.

23. The method of claim 20 further including splitting said expanded local oscillator signal into a reference beam and a test beam.

24. The method of claim 23 further including combining at least portions of said test beams and said reference beam for use in said multiple parallel interferometric measurements.

25. The method of claim 23 further including focusing said test beam into multiple beams